BULLETIN No. 284

MAY, 1948

Klingman, D
1948

VARIETIES of OATS

For WYOMING

COMMONWEALTH MYCOLOGICAL INSTITUTE
8 - AUG. 1949

UNIVERSITY OF WYOMING
AGRICULTURAL EXPERIMENT STATION
LARAMIE, WYOMING

Legend for Cover Picture

Overland and (Victoria x Richland) x Bannock, C. I. 4173 (a sister selection of Overland), at the Wyoming Experiment Station, Laramie.

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VARIETIES OF OATS FOR WYOMING

DAYTON L. KLINGMAN[1]

Oats rank third in importance as a grain crop in Wyoming, following wheat and barley. The value of the Wyoming oat crop exceeded five million dollars in 1947. The production has varied considerably, reaching a peak of over six million bushels of oats in 1915. Later the production declined, and the ten-year average for 1934-1943 was 3,018,000 bushels. Following 1943, the production of all cereals turned upward, oats among them. In 1947 there were over five million bushels of oats produced in Wyoming.

Oats are valued as a feed crop, especially for young animals and breeding stock. They are higher in protein and tend to be less fattening than barley or corn.

The oats which are raised under irrigation in the intermountain region are unexcelled in quality. The grain is high in test weight and has large kernels and a low percentage of hull.

Experimental work with oats is now being done at eight stations in the state. Three (Sheridan, Gillette, and Archer) locations are dry-land stations, while the other five are irrigated (Fig. 1). A number of years of testing is usually necessary before the recommendation of a variety is possible, because of the differential response of varieties to seasons and conditions. A relatively longer period of testing is required under dry-land conditions than when the crop is irrigated. For instance, variety testing was expanded in the dry-land areas of eastern Wyoming in 1943. Since that time, covering five crop years, growing conditions have been better than average. While a record has been kept of the relative yield performance for the varieties under these conditions, it is a little difficult to predict a variety's reaction to drought conditions on the basis of its performance during the 1943-47 period, when rainfall was average or better.

The use of improved varieties will result in a higher average production of oats and in a higher return to the grower. The initial cost of

1. Assistant Professor of Agronomy; Research Assistant in Agronomy and Agricultural Economics, University of Wyoming.

obtaining seed of improved varieties is relatively low, and the production costs are no more than those of growing other varieties.

The varieties discussed in this bulletin are divided into recommended, acceptable, and not recommended. Those recommended have had the best average performance in tests in Wyoming. The varieties included in the acceptable and not recommended groups are those whose records have not been equal to the records of those recommended. In some cases the testing has not been extensive enough to permit a recommendation, and some of the unrecommended varieties may later be added to the recommended list.

The average yield of early varieties, under irrigation in areas of 90-days growing season or more, has not been as high as that of the better midseason varieties.

RECOMMENDED VARIETIES

Varieties for Irrigated Soils.

Bannock (C.I. 2592)[1] is a high-yielding, white-kerneled, smut-resistant, midseason oat variety adapted to the irrigated lands in Wyoming. It is slightly shorter and earlier than Victory, being five inches shorter and four days earlier heading at Laramie (Table 2). In strength of straw Bannock is approximately equal to Victory. It is almost equal to Victory in weight per bushel and does not differ significantly in percentage of hull (Table 9), although it has averaged 0.6 per cent higher in this character. The kernels of Bannock are slightly smaller than those of Victory, but this factor is relatively unimportant in its effect upon feeding value. In yield Bannock has slightly the best average record of the named varieties tested under irrigation (Fig. 2 and Tables 1, 3, 4, and 7). In these tests, Bannock has averaged 112.3 bushels per acre compared to 111.2 bushels for Victory, 110.1 bushels for Markton, 106.5 bushels for Colorado 37, and 104.8 bushels for Swedish Select. Bannock's yield record on dry-land (Table 5 and 8) has not been outstanding. It has yielded less, on the average, than Markton but more than Victory or Swedish Select.

Bannock is a selection from the cross Markton x Victory. The selec-

1. "C.I. No." is the accession number assigned by the U.S.D.A.

tion was made by G. A. Wiebe of the Office of Cereal Crops and Diseases, U. S. Department of Agriculture.

Overland (C.I. 4181) is a short, strong-strawed variety of oats which produces good quality white grain. Overland is resistant to the smuts and to many races of stem-rust. It is, however, susceptible to the Helminthosporium disease which has caused damage in the Midwest. It is particularly well adapted to those irrigated soils on which lodging is a problem. In the experimental plots, when such varieties as Victory and Bannock have lodged 30 per cent or more, Overland has gone down less than five per cent. Overland has averaged eight to 14 inches shorter strawed than Bannock and Victory (Table 2), a factor which makes the grain advantageous for combine harvesting. It also has been of desirable height for binding but would give lower yields of hay than the tall varieties. It is about equal to Bannock in weight per bushel. In the single determination of percentage of hull, in 1945, Overland showed the lowest percentage of hull of all named varieties, with the exception of Markton, which was lower (Table 9). Overland has headed three days earlier than Bannock

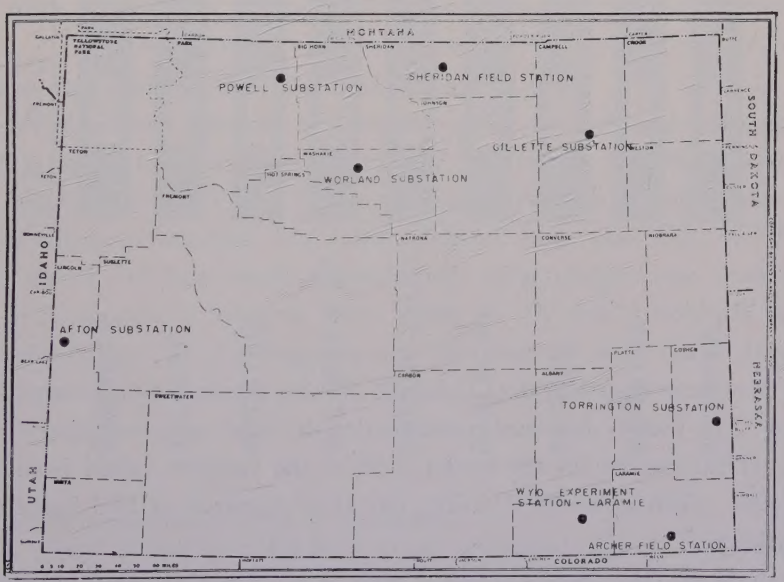

FIG. 1. Stations at which oat varieties are being tested in Wyoming.

(Table 2). Overland's yield record on irrigated land is just slightly less than that of Bannock (Table 4). In the seven comparable tests Overland yielded 99.2 bushels per acre compared to 101.6 bushels per acre for Bannock. In the dry-land tests Overland has not yielded quite as well as Markton (Table 8), averaging approximately 97 per cent of the latter variety's yield for the period compared.

Markton (C.I. 2053) is a midseason, smut-resistant, yellow-kerneled oat variety with a good yield record both on dry-land and irrigated land. Markton has relatively long slender kernels that are very low in the percentage of hull (Table 9). The weight per bushel is approximately equal to Bannock (Table 2). The yield of Markton in the 12 comparable irrigated tests in Wyoming has averaged 2.2 and 1.1 bushels per acre less than the yields of Bannock and Victory respectively, but 3.6 bushels more than that of Colorado 37 (Fig. 2 and Tables 1, 3, and 7).

The seed from which Markton was later selected was obtained by Mark A. Carleton from an exhibit held in St. Louis, Missouri, in 1904. Head selections were made from a portion of this seed at Moro, Oregon in 1910 and tested for three years. One of the best of these was named Markton. Markton was introduced into Wyoming in 1924 and since that time has had one of the best records of the varieties grown.

Victory (C.I. 1145) is a midseason, tall, high-yielding, high-quality, large white-kerneled oat variety adapted to irrigated land in Wyoming. It is susceptible to the smuts. Victory has had good test weight (Table 2) and relatively low percentage of hull (Table 9). It has headed one and five days later than Swedish Select and Markton respectively and has been only slightly taller than Swedish Select and five inches taller than Markton (Table 2). In yield, under irrigated conditions, it is just slightly lower than Bannock but has averaged 1.1, 4.7, and 6.4 bushels per acre more than Markton, Colorado 37, and Swedish Select respectively (Fig. 2). Victory has been unadapted to dry-land oat production (Table 5). It has had by far the lowest yield of the varieties raised from 1935 to 1947, yielding but 34.1 bushels per acre compared to 53.0 bushels for Markton.

Victory was originated about 1904 at the Plant Breeding Station at Svalof, Sweden, as a pure line selection from the old Probsteier variety.

Colorado 37 (C.I. 1640) is a midseason, tall, relatively stiff-strawed variety which produces large white kernels of high weight per bushel (Table 2). In per cent hull Colorado 37 is approximately equal to Bannock (Table 9). It has been susceptible to oat smut, and the seed should always be treated to control the disease.

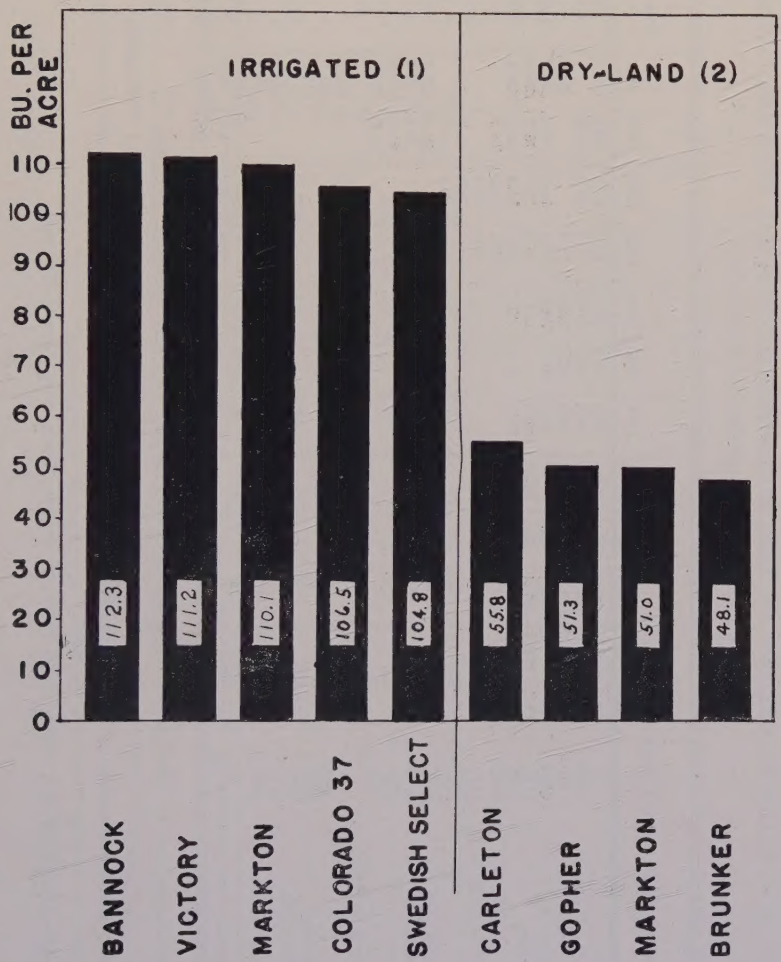

FIG. 2. Weighted average yields of oat varieties.

(1) Grown at: Laramie, 7 years; Torrington, 2 years; and the Big Horn Basin, 3 locations; or a total of 12 station-years.

(2) Grown at: Sheridan, 12 years; Gillette, 5 years; Archer, 3 years; Albin, 1 year; or a total of 21 station-years.

Table 1.

YIELDS OF VARIETIES GROWN AT THE WYOMING EXPERIMENT STATION, LARAMIE, WYO.

(Yields are in Bushels Per Acre) (a)

Variety	C.I. No. (b)	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1945	1947	1936-47 Av.	Per cent of Markton (c)
Swedish Select	124	82.0	124.4	165.0	133.0	100.5	43.9	91.2	108.8	85.5	81.1	68.4	121.5	99.9	99
Banner	1191	104.7	128.3	167.8	142.8	109.2	44.3	80.6	114.4	85.3	82.3	88.6			106
Colorado 37	1640	83.0	134.7	172.3	151.4	96.1	40.0	82.2	115.6	77.4			125.3		102
Bannock	2592			164.4	152.2	104.5	47.3	87.5	106.3	93.4	90.3	80.4	132.3	105.9	103
Victory	1145	77.7	128.4	167.8	143.1	103.9	50.2		121.9	94.8	79.5	78.7	124.9		104
Markton	2053	79.3	112.3	142.6	137.8	109.2	52.0	88.4	113.1	88.8	76.2	82.9	134.4	102.5	100
Bridger	2611									95.2	77.0	78.3			101
Uton	3141									88.8	74.7				99
Minton	2574										77.7	81.3			100
Marida	2571										82.4	84.3			105
(V-R) x Bannock (d)	3916											95.9	126.2		102
(V-R) x Bannock (d)	4180											90.4	99.8		88
Overland	4181											84.1	103.6		86
Carleton	2378											80.2	127.2		95
(V-R) x Bannock WN4131 (d)													131.2		98
Vicland	3611												131.1		98
Anthony x Morota	4267												117.2		87
(V-R) x Bannock (d)	4173												111.4		83
Andrew	4170												101.7		76
Clinton	3971												67.2		50
Difference necessary for significance (5% level) (e)										8.8	8.8	18.9	19.2		

(a) Oats were hailed out in 1944; in 1946 birds did so much damage that yield data are unreliable.

(b) C.I. No. is the accession number assigned to each variety by the United States Department of Agriculture.

(c) Per cent figures comparable to Markton, only. Markton = 100%.

(d) (V-R) refers to a cross Victoria x Richland.

(e) A difference exceeding that shown could occur by chance, alone, only once in 20 trials.

Table 2.

AGRONOMIC DATA FOR OAT VARIETIES GROWN AT THE WYOMING EXPERIMENT STATION, LARAMIE, WYOMING

Variety	C.I. No.	Av. Date Headed (July)			Av. Height (inches)			Av. Weight per Bu. (lbs.)		
		1945	1947	1945-'47	1945	1947	1945-'47	1945	1947	1945-'47
Swedish Select	134	22	24	23	41.4	51	46.2	36.5	38.5	37.5
Colorado 37	1640	22(a)	24	23	40.0(a)	51	45.5	40.0(a)	38.0	39.0
Bannock	2592	20	21	20	38.6	44	41.3	37.0	37.0	37.0
Victory	1145	23	25	24	41.2	52	46.6	36.0	38.4	37.0
Markton	2053	19	20	19	38.6	44	41.3	37.0	37.4	37.2
Bridger	2611	23			46.0			37.0		
Minton	2574	23			41.2			37.5		
Marida	2571	19			34.6			38.0		
(V-R) x Bannock	3916	19	16	17	29.4	34	31.7	38.0	37.1	37.5
(V-R) x Bannock	4180	15	13	14	29.4	35	32.2	36.0	36.1	36.0
Overland	4181	17	17	17	30.8	35	32.9	38.0	35.6	36.8
Carleton	2378	17	17	17	30.8	37	33.9	36.0	38.8	37.4
(V-R) x Bannock WN4131			21			42			36.3	
Vicland	3611		12			33			35.4	
Anthony x Morota	4267		21			46			36.1	
(V-R) x Bannock	4173		17			36			37.1	
Andrew	4170		7			36			33.0	
Clinton	3971		13			37			36.0	

(a) Data taken from nearby nursery.

Table 3.

YIELDS OF VARIETIES GROWN IN THE OAT VARIETY NURSERY AT LARAMIE

Variety	C.I.No.	BUSHELS PER ACRE				1942-'47	Per cent of
		1942	1943	1945	1947	Av. (a)	Bannock (b)
Markton	2053		98.9	98.4			96
Marvic	2597			96.1			103
Bannock	2592	91.6	113.1	92.9	149.4	111.7	100
Sun W191		94.2	96.4	95.4			96
Colorado 37	1640		101.2	91.6			93
Swedish Select	134	88.6	98.2	91.5			93
Gopher	2027	70.3	108.2	90.0	108.8	94.3	84
Uton	3141		99.8	87.9			91
Carleton	2378	81.4	104.2	87.8			92
Cornellian	1842	81.3	100.7	83.5			89
Vicland	3611	78.9	96.4	86.5	103.5	91.3	82
Tama	3502	74.5		84.6			86
Vikota	3602			84.3			91
Cedar	3314			83.4			90
Marion	3427	72.4	97.2	77.6			83
Boone	3305	79.5	94.3	75.6			84
Bridger	2611		102.3				90
Brunker	2054	49.3	80.7		66.4		55
Trojan	2491	48.4			58.3		44
Fulton	3327	68.7			102.8		71
Garry					129.8		87
Mission	2588				128.1		86
Overland	4181				127.5		85
Osage	3991				95.7		64
Clinton	3971				75.6		51
Andrew	4170				106.2		71
Difference necessary for significance (5% level) (c)	.....	22.9	13.6	16.1	25.2	9.9	

(a) Crop hailed out in 1944; the crop was injured so severely in 1946 by birds that data are unreliable.

(b) Per cent figures comparable to Bannock, only. Bannock = 100%.

(c) A difference exceeding that shown could occur by chance, alone, once in 20 trials.

Colorado 37 has yielded more than Swedish Select, but 5.8, 4.7, and 3.6 bushels per acre less than Bannock, Victory, and Markton respectively on irrigated land in Wyoming (Fig.2). The variety has headed on about the same date as Swedish Select and Victory (Table 2) and has been about the same height.

Colorado 37 is a selection made in 1900 at the Colorado Agricultural Experiment Station from an unnamed commercial variety.

Varieties for Dry-Land Soils.

Markton (C.I. 2053) which is also recommended for irrigated conditions is briefly described above. Markton has an excellent long time yield record at Sheridan (Table 5). While it has averaged 1.7 bushels per acre less than Carleton in the 14 years grown on dry-land, it has exceeded Carleton in yield seven out of 14 years. In this same period (1934-1947) Markton has equalled Gopher in yield and has exceeded all other varieties which have been grown for 13 years. When all the dry-land yield data is averaged together (Fig. 2), Markton maintains approximately the same place in yield as shown in Table 5. Because of the variety's yield record, smut resistance, and good grain quality, it is recommended for growing on dry-land, especially in northeastern Wyoming.

Brunker (C.I. 2024) is a very early, drought-evading, red oat variety, with relatively weak straw. It is adapted to the dry-lands of eastern Wyoming, particularly the southeastern part. Brunker has resistance to oat smut. Its average yield record has not been quite equal to that of Markton (Fig. 2, Tables 5, 7, and 8). However, it has averaged slightly higher in weight per bushel than Markton (Table 6), and it has a low percentage of hull (Table 9). Brunker has averaged eight days earlier heading and nine days earlier ripening than Markton (Table 6). In plant height it has averaged four inches shorter than Markton at Sheridan.

Brunker was selected from Burt at the U. S. Dry-land Field Station, Akron, Colorado.

Brunker's drought-evading quality is based on its earliness. Most of the rainfall in eastern Wyoming occurs in the spring and early summer.

Table 4.

A COMPARISON OF THE YIELDS OF BANNOCK AND OVERLAND IN IRRIGATED TESTS IN WYOMING.

		Bushels per Acre							
		Laramie			Torrington		Wor-land	Afton	Av.
Variety	C.I. No.	1943	1945	1947	1946	1947	1947	1947	7 Tests
Bannock	2592	94.6	87.8	136.8	96.4	96.7	87.4	111.4	101.6
Overland	4181	85.3	93.0	104.3	106.6	107.9	91.4	105.7	99.2
Difference necessary for significance (5% level) (a)		23.6	10.7	9.2	22.9	14.0	24.4	18.4	7.0

(a) A difference exceeding that shown could occur by chance, alone, only once in 20 trials.

Table 5.

YIELDS OF VARIETIES OF OATS GROWN ON THE SHERIDAN FIELD STATION, SHERIDAN, WYOMING

(Yields Are Given in Bushels Per Acre)

Variety	C.I. No.	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944 (a)	1945	1946	1947	1935-1947 Av.	1944-1947 Av.	Percent of Markton (b)
Brunker	2054	48.7	17.2	5.2	55.6	78.5	51.6	44.0	53.9			20.9	79.1	57.3	59.0	.	54.1	91
Carleton	2378	47.5	27.5	8.6	38.4	83.1	82.5	49.8	66.5	55.0	65.9	44.1	76.2	68.2	51.6	55.2	60.0	103
Gopher	2027	46.4	25.2	4.0	33.2	80.8	74.5	48.1	63.3	55.6	65.9	33.0	76.8	69.3	64.7	53.4	60.9	100
Markton	2053	51.6	16.0	8.0	23.5	85.3	84.8	51.0	67.0	52.7	61.3	35.2	68.7	87.7	47.3	53.0	59.7	100
Iogold	2329	47.5	28.1	4.6	34.9	83.1	78.5	43.5	59.6									98
Victory	742	37.8	13.2	1.7	20.1	76.8	66.5	38.4	49.3	30.3	56.7	16.3	28.9	22.9	21.8	34.1	22.4	65
Swedish Select	134	38.4	16.1	2.9	24.1	76.2	64.7	39.0	61.3	38.4								82
Bannock	2592		22.9	4.0	22.9	81.4	83.7	43.0	65.9	44.1	66.5	35.6	50.4	48.7	40.1	46.9	43.7	88
Fulghum x Markton	3220				48.1	77.3	64.2	47.0	72.8	63.6	58.4	10.9	63.9					95
Fulton	3327						71.6	43.0	61.9									87
Marion	3247						69.3	42.4	59.0	56.7		16.0	69.0	67.0	49.3		50.3	87
Boone	3305						69.9	39.5	57.3	57.9								88
Erban	3477							45.2										89
Vanguard No. 7	3478							39.5	49.3	52.2	61.3	29.2	67.3	50.4				82
Valor	4137									55.6	45.3	19.5	72.8	77.3	38.4		52.0	101
Bridger	2611									34.4	59.0	18.6						75
Marida	2571									42.4			76.5	37.8	33.2			74
Vicland	3611											32.9	64.7					98
Mission	2588											75.1	75.1	68.7	46.1		66.2	111
Ajax	4157												85.7	72.7	38.1			119
Clinton	3971												82.8	46.4	42.1			104
Benton	3910												74.5	54.4	40.7			103
Overland	4181												76.8					112
Forvic	4164													59.0	29.8			66
Osage	3991													68.7	43.5			83
(V-R) x Bannock	3916													.	.			
Eaton	3908													69.9	34.7			77
Mohawk	4327													56.1	60.1			86
Bonda	4329														50.1			106
Mindo															55.0			116
															54.4			115

(a) Heavy hail July 9.

(b) Percentage figures are comparable to Markton, only. Markton = 100%.

Table 6.

AGRONOMIC DATA FOR OAT VARIETIES GROWN AT THE SHERIDAN FIELD STATION
(DRY-LAND)

Variety	C.I. No.	Av. Date Headed		Av. Date Ripe		Av. Plant Height (In.)		Av. Weight per Bu. (lb.)	
		1939-41	1939-46	1939-41	1939-46	1939-41	1939-46	1939-41	1939-46
Victory	742	6/27	6/28	7/28	8/2	36	40	33	34
Swedish Select	134	6/25		7/28		36		34	
Bannock	2592	6/25	7/1	7/26	7/31	34	39	33	34
Markton	2053	6/22	6/28	7/25	7/26	35	41	34	34
Gopher	2027	6/20	6/22	7/21	7/25	31	37	36	34
Carleton	2378	6/20	6/26	7/20	7/25	31	37	34	33
Brunker	2054	6/14		7/16		31		35	
Fulton	3327	6/14		7/19		32		34	
Marion	3247	6/18		7/20		33		36	
Boone	3305	6/20		7/21		31		36	
Minton	2574	6/26		7/27		37		33	
Fulghum x Markton	3220	6/11		7/22		32		34	

The very early varieties, therefore, are usually further developed prior to the hot, dry weather and thus partially evade "drought effects."

ACCEPTABLE VARIETIES

Bridger (C.I. 2611) is a tall, relatively strong-strawed, white-kerneled oat variety with resistance to many smut races. It has not been quite equal to Bannock in yield performance in Wyoming (Table 1, 3, and 7). Bridger is three days later heading and the tallest oat variety tested at Laramie, being 46 inches tall compared to 39 for Bannock (Table 2).

Bridger is a selection from a cross of Markton x Victory made at the Aberdeen substation, Aberdeen, Idaho. It was released by the Montana Agricultural Experiment Station in 1941.

Marida (C.I. 2571) is a midseason, strong-strawed, white-kerneled oat variety which is resistant to the smuts. It is about one day earlier heading and four inches shorter strawed than Bannock. It has good weight per bushel and the lowest percentage of hulls of the varieties tested (Table 9). Marida has not quite equalled Bannock in yield record (Tables 1, 5, 7, and 8), nor does it have as strong straw as Overland.

Marida was selected from the cross Markton x Idamine.

Carleton (C.I. 2378) is a short, strong-strawed, smut-resistant, yellow-kerneled variety of oats which has given high yields on dry-land in Wyoming and which has also given good yields when irrigated. Carleton has averaged the highest yields of any of the varieties grown at the Sheridan Field Station (Table 5). It has also outyielded Markton by 10 per cent at Gillette and Archer (Table 8). The grain of Carleton is long and slender and doesn't appeal to some growers as much as the shorter plumper grains of certain other oat varieties. In test weight Carleton has averaged one pound less than Markton at Sheridan (Table 6), but in percentage hull it has a good record (Table 9). Carleton has headed two days earlier than Markton, has ripened one day earlier, and has been four inches shorter in height (Table 6).

Mission (C.I. 2588) is a white-kerneled, midseason, mid-tall variety of oats which is resistant to oat smut. It has an excellent record at Sheridan during the four years it has been grown (Table 5) and was about equal to Markton in 1947 at Archer and Gillette (Table 8). If its good performance continues, it will probably be added to the recommended list for growing on dry-land.

Table 7.

YIELD OF THE OAT VARIETIES GROWN ON IRRIGATED LAND IN COOPERATION WITH THE SUBSTATIONS

Variety	C.I. No.	TORRINGTON Average Yield in Bushels Per Acre							AFTON Average Yield in Bushels Per Acre					
		1943	1944	1945	1946	1947	Av. 1944-47	% of Markton (a)	1944	1945	1946	1947	Av. 1944-47	% of Markton (a)
Bannock	2592	51.2	57.0		96.4	96.7		98	61.6	25.3		111.4		99
Marida	2571	50.5	63.6	79.1				117	74.9	25.0				102
Markton	2053	40.6	51.1	73.8	105.7	111.0	85.4	100	57.8	39.6	95.6	102.5	73.9	100
Victory	1145	37.2	66.3	92.7	90.1	104.4	88.4	103						
Swedish Select	134	35.8	46.1	67.0	97.3	90.9	75.3	88	70.0					121
Vicland	3611	31.8	58.8	59.3		96.9		89	74.8	47.4	103.3	98.8	81.1	110
Minton	2574	30.4	42.2					82						
Uton	3141	26.9	39.2					72						
Bridger	2611	21.5	44.8	75.5				86						
Tama	3502		60.6	65.5				101	70.6	48.9				123
Marion	3427													
Gopher	2027								80.6	48.1	102.1	124.1	88.7	120
Boone	3305		65.0					127						
Brunker	2024									39.5	89.8	75.4		86
Carleton	2378		79.3	98.9	99.1	106.0	95.8	112	86.4	44.0	116.6	94.2	85.3	115
Fulton	3327									52.0	97.2	94.6		103
(V-R) x Bannock	3916		66.4	79.7	113.0	108.9	92.0	108	80.8	35.3	106.7	121.2	86.0	116
(V-R) x Bannock	4180		73.6	75.8	85.8	105.6	85.2	100	94.4	39.6	105.0	133.4	93.1	126
Colo. 37	1640			67.4	88.8	97.3		87						
Fulghum x Markton	3220									42.2	92.4			100
Overland	4181			80.6	106.6	107.9		102		40.0	101.0	105.7		104
Trojan	2491										88.5	93.2		92
(V-R) x Bannock	4173				95.5	101.2		91			99.8	117.1		109
Clinton	3971					75.1		67			90.8	81.6		87
Osage	3991										89.9			94
Mission	2588					108.5		98				120.9		118
Andrew	4170					88.8		80				84.0		82
(V-R) x (Morota-Bond)	4301					67.8		61				77.7		76
(V-R) x Bannock WN4131						108.8		98						
Difference necessary for significance (5% level) (b)		12.4	22.0	19.4	23.8	14.0	10.0			14.4	24.6	18.4		

(a) Per cent figures comparable to Markton, only. Markton = 100%.

(b) A difference exceeding that shown could occur by chance alone, only once in twenty trials.

Mission is a selection from a Markton x Victory cross and was released in Montana to be grown in the dry-land areas.

Gopher (C.I. 2027) is an early white-kerneled oat variety, with strong straw and good yields under dry-land conditions. Gopher is susceptible to the rusts and smuts. When all dry-land tests are averaged together, the variety has yielded 0.3 bushel per acre more than Markton (Fig. 2). Markton and Gopher are equal in yield for the 14 years (1934 to 1947) grown at Sheridan (Table 5). Gopher gave slightly the better yields at Gillette and Archer (Table 8) and also at Afton (irrigated) (Table 7).

Gopher has headed six days earlier, ripened one day earlier, averaged four inches shorter, and had the same weight per bushel as Markton at Sheridan (Table 6).

Gopher is an early selection from Sixty Day made by the Minnesota Agricultural Experiment Station in 1917.

Fulton (C.I. 3327) is an early, red oat variety which has given good yields on dry-land. It has resistance to some races of oat smut. Fulton has been outyielded by Markton for the short period grown at Sheridan (Table 5) but has exceeded Markton at Gillette and been about equal to Markton at Archer (Table 8). The variety was selected from a Fulghum x Markton Cross at the Kansas Agricultural Experiment Station.

Vicland (C.I. 3611) is an early, short, strong-strawed, rust- and smut-resistant, yellow-kerneled variety, but it is susceptible to the Helminthosporium disease which has been so severe in the Midwest. It has a good yield record on dry-land but has averaged considerably less than the recommended varieties under irrigated conditions. It has slightly exceeded Markton in yield at Gillette and Archer but gave slightly less yield at Albin (Table 8) and Sheridan (Table 7). When grown on irrigated land, Vicland has averaged considerably less than Bannock and Overland and can well be replaced by one of these varieties. It is five and eight days earlier heading than either Overland and Bannock respectively at Laramie (Table 2), and has stronger straw than Bannock but weaker straw than Overland.

Vicland, which resulted from the cross Victoria x Richland, was developed by the Wisconsin Agricultural Experiment Station cooperatively with the U. S. Department of Agriculture.

Tama (C.I. 3502) and *Boone* (C.I. 3305) are similar to Vicland in most observable characters, and the description above may be used for Tama and Boone. They also were selected from Victoria x Richland.

Table 7. (Cont.)

YIELD OF THE OAT VARIETIES GROWN ON IRRIGATED LAND IN COOPERATION WITH THE SUBSTATIONS

Variety	C.I. No.	BIG HORN BASIN				
		Average Yield in Bushels Per Acre				
		Cody (c) 1944	Powell (d) 1944	Worland 1947	Av.	% of Markton (a)
Bannock	2592	149.4	117.1	87.4	118.0	108
Marida	2571	132.6	103.1			98
Markton	2053	136.9	102.9	87.0	108.9	100
Victory	1145	127.5	109.3	96.6	111.1	102
Swedish Select	134	127.1	99.4	85.3	103.9	95
Vicland	3611	128.6	105.8	86.6	107.0	98
Minton	2574					
Uton	3141					
Bridger	2611	131.1	105.6			99
Tama	3502					
Marion	3427					
Gopher	2027					
Boone	3305	134.5	103.1			99
Brunker	2024					
Carleton	2378			97.0		111
Fulton	3327					
(V-R) x Bannock	3916	166.8	139.4	77.5	127.9	117
(V-R) x Bannock	4180	159.4	110.0	79.1	116.2	107
Colo. 37	1640	137.8	111.2	65.7	104.9	96
Fulghum x Markton	3220					
Overland	4181			91.4		105
Trojan	2491					
(V-R) x Bannock	4173			94.1		108
Clinton	3971			79.2		91
Osage	3991					
Mission	2588			91.8		105
Andrew	4170			83.6		96
(V-R) x (Morota-Bond)	4301			67.8		78
(V-R) x Bannock WN4131				94.6		109
Difference necessary for significance (5% level) (b)		18.0	26.6	24.4	12.0	

(a) Per cent figures comparable to Markton, only. Markton = 100%.

(b) A difference exceeding that shown could occur by chance alone, only once in twenty trials.

(c) J. Legg farm, Cody, with the cooperation of J. M. Nicholls, Park County Agricultural Agent.

(d) R. A. Allen farm, Powell, with the cooperation of J. M. Nicholls, Park County Agricultural Agent.

They were developed cooperatively by the Iowa Experiment Station and the U. S. Department of Agriculture and do not differ greatly in yielding ability from Vicland.

Cedar (C.I. 3314) is another strain quite similar in appearance to Vicland, Tama, and Boone, and the description will not be repeated. Cedar was selected from Victoria x Richland at the Iowa Agricultural Experiment Station and released as a superior variety in Nebraska in 1943.

Table 8.

YIELD OF THE OAT VARIETIES GROWN ON DRY-LAND IN COOPERATION WITH THE SUBSTATIONS

		GILLETTE							ARCHER						ALBIN (c)
		Average Yield in Bushels Per Acre							Average Yield in Bushels Per Acre						
Variety	C.I. No.	1943	1944	1945	1946	1947	Av. 1943-47	% of Markton (a)	1944	1945	1946 (d)	1947	Av. 1944-47	% of Markton (a)	1946
Bannock	2592			49.9				86		60.1				103	
Marida	2571			45.4				78		59.9				102	
Markton	2053	40.6	48.0	57.8	37.2	51.7	47.1	100	48.4	58.4		38.9	48.6	100	62.3
Victory	1145														
Swedish Select	134														
Vicland	3611	48.2	69.5	56.8	33.0	45.1	50.5	107	52.8	56.4		45.8	51.7	106	58.9
Minton	2574														
Uton	3141														
Bridger	2611														
Tama	3502	52.2	60.5	54.4				114	54.5	50.1					
Marion	3427	49.3	63.0					127	47.4						
Gopher	2027	49.0	69.3	55.1	38.0	48.0	52.0	110	55.4	57.4		39.8	50.9	105	45.5
Boone	3305	48.8	61.2					124	50.2	50.2					
Brunker	2024	48.2	69.5	48.9	28.0	48.2	48.6	103	48.7	67.7		25.8	47.4	98	54.1
Carleton	2378	48.0	64.6	59.9	37.6	49.7	51.9	110	51.0	60.5		49.0	53.5	110	64.8
Fulton	3327		72.7	58.9	27.2	44.8		105	54.8	51.0		38.5	48.1	99	49.0
(V-R) x Bannock	3916	47.4	68.4	42.4	39.1	48.5	49.2	104	55.8	60.4		41.1	52.4	108	61.6
(V-R) x Bannock	4180		64.6	54.1	31.2	42.2		99	63.2	59.7		51.8	58.2	120	61.9
Colo. 37	1640														
Fulghum x Markton	3220		60.5	52.8	24.6			96	56.2	60.9				110	46.9
Overland	4181			55.1	34.7	50.3		96		55.3		38.8		97	63.5
Trojan	2491			50.0	28.1	43.6		83		45.8		31.8		80	54.8
(V-R) x Bannock	4173				40.5	52.0		104				39.6		102	60.2
Clinton	3971				28.7	46.6		85				42.5		109	59.7
Osage	3991				34.2	48.5		93				35.8		92	48.7
Mission	2588					50.5		96				40.4		104	
Andrew	4170					47.4		92				35.2		90	
(V-R) x (Morota-Bond)	4301					48.3		93				27.3		70	
(V-R) x Bannock WN4131															
Difference necessary for significance (5% level) (b)		4.8	8.8	10.4	14.4	9.8	4.5		12.2	8.4		9.6	5.9		12.8

(a) Per cent figures comparable to Markton, only. Markton = 100%.
(b) A difference exceeding that shown could occur by chance alone, only once in twenty trials.
(c) John Ecklund farm, Albin, Wyoming.
(d) Yield data unreliable in 1946.

Table 9.

RELATIVE PERCENTAGE OF HULLS OF OAT VARIETIES GROWN IN WYOMING IN 1944 AND 1945

Variety	C.I. No.	Per cent hull for irrigated oat varieties					Per cent hull for dry-land oat varieties		
		Laramie 1945	Cody (a) 1944	Powell (b) 1944	Torrington 1944	Av.	Gillette 1944	Archer 1944	Av.
Swedish Select	134	30.3	26.4	25.8	26.8	27.3			
Bannock	2592	24.9	26.7	26.5	26.9	26.2			
Victory	1145	27.4	25.0	26.0	24.0	25.6			
Markton	2053	22.7	27.3	23.4	24.5	24.5			
Bridger	2611	27.6	26.9	25.6	25.0	26.3			
Minton	2574	25.9			25.4				
Marida	2571	24.1	24.3	23.8	24.1	24.1			
(V-R) x Bannock	3916	24.7	26.9	25.1	24.8	25.4	30.9	26.4	28.7
(V-R) x Bannock	4180	21.7	27.0	24.4	22.0	23.8	33.4	23.9	28.7
Overland	4181	23.5							
Carleton	2378	23.8			23.4		31.0	25.0	28.0
Vicland	3611		29.5	26.0	24.8		32.5	28.0	30.3
Boone	3305		26.3	25.4	25.3		34.7	24.9	29.8
Colo. 37	1640		27.9	25.0					
Tama	3502				25.5		35.0	24.1	29.5
Fulton	3327						25.0	22.7	23.9
Brunker	2054						26.8	22.5	24.7
Gopher	2027						28.1	21.7	24.9
Fulghum x Markton	3220						27.0	23.8	25.4
Marion	3247						29.8	22.7	26.3
Difference necessary for significance (5% level) (c)		1.9	3.5	3.0	1.5	1.3	4.9	3.1	2.9

(a) Grown by J. Legg in cooperation with J. M. Nicholls, Park County Agricultural Agent.

(b) Grown by R. Allen in cooperation with J. M. Nicholls, Park County Agricultural Agent.

(c) A difference exceeding that shown could occur by chance, alone, only once in twenty trials.

FIG. 3. Swedish Select and Bannock Oat plots at the Wyoming Experiment Station, Laramie. Picture taken in 1946.

Vikota (C.I. 3602) has the same general history and appearance as Cedar above but was the particular strain best adapted to South Dakota and released by that state in 1943.

Marion (C.I. 3427) is a moderately short, yellow-kerneled variety which has considerable rust and smut resistance. It also is resistant to the new Helminthosporium disease which has caused damage in the Midwest. The variety has not been equal to Markton or Vicland in tests in Wyoming. Marion which is a selection from the Markton x Rainbow cross was developed cooperatively by the Iowa Agricultural Experiment Station and the U. S. Department of Agriculture.

VARIETIES NOT RECOMMENDED

Varieties included in this group are those whose average performance is inferior to those recommended, or which have been tested insufficiently. Recommendation is therefore withheld pending additional testing.

Swedish Select (C.I. 134) is a midseason, relatively strong-strawed variety with large white grain of good quality. It has been the lowest yielder of those shown in Fig. 1 and has yielded 7.5 bushels less than Bannock. Swedish Select has long been grown in Wyoming but can advantageously be replaced by the improved varieties available.

Uton (C.I. 3141) is a midseason, white-grained, smut-resistant oat variety which is somewhat similar to Swedish Select in agronomic characters. This grain has not been equal to Bannock in tests in Wyoming (Tables 1, 3, and 7). Uton is a selection from a Markton x Swedish Select cross which has been released by the Utah Agricultural Experiment Station.

Clinton (C.I. 3971) is a medium height, strong-strawed, yellow-grained, relatively early oat variety with plump kernels and thin hulls. It is resistant to most of the races of rusts, to the oat smuts, and to the new Helminthosporium disease. The Clinton oat has been grown from one to three years at the various locations in Wyoming and has yielded less than Markton in 12 out of 13 separate tests conducted on both irrigated and dry-land (Tables 1, 3, 5, 7, and 8). Clinton is a selection from the cross D69 x Bond. D69 is a selection from Richland x Green Russian. Clinton was developed cooperatively by the Iowa Agricultural Experiment Station and the U. S. Department of Agriculture.

Bonda (C.I. 4329) is an early, yellowish-white grained, strong-strawed variety of oats which has high test weight and resistance to the rusts and smuts. It is also resistant to Helminthosporium disease. In the one year of testing in Wyoming Bonda yielded 62.9 bushels less than Markton at Laramie, and 7.7 bushels more at Sheridan (Tables 1 and 5). Bonda was selected at the Minnesota Agricultural Experiment Station from a cross Bond x Anthony.

Andrew (C.I. 4170) is an early-maturing, yellow-grained, strong-strawed variety with high yielding ability. It has had the best yield record of the varieties grown in the cooperative tests in the corn belt. It is resistant to the rusts and smuts. In the single year tested in Wyoming its yield record has not been outstanding (Tables 7 and 8). Andrew was developed by the Minnesota Agricultural Experiment Station from the cross Bond x Rainbow.

Eaton (C.I. 3908) is an early, strong-strawed variety which is three days earlier heading than Markton. It is resistant to most rust races and to smut, as well as to Helminthosporium disease. It exceeded the yield of Markton one year of the three grown at Sheridan (Table 5) but was considerably lower in yield at Laramie. Eaton is a selection from a cross of Bond x Iogold that has been released in Michigan.

Osage (C.I. 3991) is a short, early, red oat variety, which is resistant to many races of the rusts and smuts. In the two years tested in Wyo-

ming it has yielded less than Markton (Tables 3, 5, 7, and 8). It is a selection from (Victoria x Richland) x Fulton.

Trojan (C.I. 2491) is an early, strong-strawed, white-grained variety with resistance to smut. This grain has given lower yields than Markton in the two years tested in Wyoming (Tables 3, 7, and 8). It is a selection from Burt made by F. A. Coffman at the U. S. Dry-land Field Station, Akron, Colorado.

SUMMARY

The use of improved varieties available will result in a higher average production of oats in Wyoming.

1. The following varieties of oats are recommended for irrigated land.
   a. *Bannock* is a midseason, high-yielding, smut-resistant, white-kerneled variety of oats with the best yield record of the named varieties.
   b. *Overland* is a short, strong-strawed variety of oats which produces good quality white grain. It is particularly well adapted to those irrigated soils on which lodging is a problem. Yields have been slightly less than for Bannock.
   c. *Markton* is a midseason, smut-resistant, yellow-kerneled oat variety with a good yield record of high quality grain.
   d. *Victory* is a midseason, tall, high-yielding variety which has large white kernels. It is susceptible to smut.
   e. *Colorado 37* is a midseason, tall variety which produces large white kernels of high weight per bushel. Colorado 37 is susceptible to oat smut and seed should always be treated to control the disease.
2. The following varieties of oats are recommended for dry-land.
   a. *Markton* is briefly described above.
   b. *Brunker* is a very early, drought-evading red oat variety resistant to oat smut, but it has relatively weak straw.
3. Acceptable varieties are those varieties having a good record but which have not been placed on the recommended list.
   a. *Bridger* is very tall and later than Bannock.
   b. *Marida* has had slightly lower yields than Bannock, and its straw is not as strong as that of Overland.

c. *Carleton* has had a good yield record, stands well, and is smut resistant. The grain is not as attractive as desired.

d. *Mission* is a midseason, mid-tall variety with an excellent yield record on dry-land for the period tested.

e. *Gopher* is an early, white-kerneled variety with strong straw and good yields on dry-land.

f. *Fulton* is an early, red oat variety with good yields on dry-land for the period grown.

g. *Vicland* is an early, short, strong-strawed variety with a good record on dry-land, but it has averaged considerably less than Markton and Bannock when irrigated.

h. *Tama, Cedar,* and *Vikota* are quite similar to Vicland.

i. *Marion* is a moderately short-strawed, yellow-kerneled variety whose average yield record has not been equal to Markton.

4. Varieties not recommended include those whose record is inferior to the records of those recommended and of those which have been tested for but a short time and on which recommendation is withheld pending additional evaluation.

Swedish Select, Uton, Clinton, Bonda, Andrew, Eaton, Osage, and *Trojan.*

ACKNOWLEDGMENT

Acknowledgment is made of the work done prior to 1942 by R. F. Eslick and Glen Hartman at the Wyoming Experiment Station, Laramie, and to the staff and students of the Agronomy Department, University of Wyoming, who have assisted in the oat research. The cooperation of W. L. Quayle and of the superintendents of the various substations who have done much of the work at those locations is appreciated. Special acknowledgment is made of the careful work done by the late R. S. Towle at the Sheridan Field Station.

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